UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/771,959	02/04/2004	Peter Hampden Clifton	169.12-0610	3842

164 7590 06/19/2006

KINNEY & LANGE, P.A.
THE KINNEY & LANGE BUILDING
312 SOUTH THIRD STREET
MINNEAPOLIS, MN 55415-1002

EXAMINER	
HOANG, TU BA	
ART UNIT	PAPER NUMBER
2832	

DATE MAILED: 06/19/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	30/771,959	CLIFTON ET AL.	
	Examiner	Art Unit	
	Tu Ba Hoang	2832	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 June 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-12,14-17 and 29-38* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-12,14-17,and 29-38* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *02 April 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Response to Arguments/Amendments

Applicant's arguments/amendments filed June 02, 2006 have been fully considered but they are not persuasive as for the following reasons:

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Amended claims 1, 3, 5-12, and 14-16 are rejected under 35 U.S.C. 102(e) as being anticipated by Kreupl (US 6,777,731). Kreupl shows a tunneling magnetoresistive stack or MTJ element 9 (shown in Figure 1) comprising a first ferromagnetic layer or pinned 5 (column 11, line 40, i.e., cobalt-iron alloy), a tunnel barrier layer 4 comprising a titanium alloy oxide (column 8, lines 25-28, i.e., strontium titanium oxides) on the first ferromagnetic layer 5, and a second ferromagnetic layer or free layer 3 (i.e., nickel-iron alloy, column 11, line 38) , wherein the tunneling magnetoresistive stack exhibits a negative exchange coupling between the first and second ferromagnetic layers 5 and 3

(column 11, lines 30-36, i.e., as the magnetization direction of the layer 3 is directed in the opposite direction to the magnetization of the layer 5, there exhibits a negative exchange coupling between these two layers), Kreupl further discloses that the titanium alloy oxide includes an oxide of a metal of the group consisting of aluminum, and hafnium (column 8, lines 24-28) and suitable barrier materials are dielectrics such as metal oxides, mixed metal oxides, and metal sulfides which can be applied by sputtering and then oxidized with oxygen or sulfur during different oxidation stages (column 8, lines 9-23), it is inherently that there must be a dopant included during oxidation (i.e., such as sulfur or oxygen) and the tunnel barrier layer 4 would also include Titanium-Aluminum oxide (i.e., mixed metal oxides of the titanium alloy oxide), and the tunnel barrier layer and the layers 3,5 each has a thickness of at least 2.5nm to 5nm (column 8, line 63) which is within the recited range of 10 Angstrom to 200 Angstrom or less than 30 Angstrom.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 29-35 and 37-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kreupl. Kreupl discloses substantially all features of the claimed invention except for the absence of an applied magnetic field. As noted above, in Kreupl, the tunneling magnetoresistive stack or MTJ element 9 (shown in Figure 1) comprising a first ferromagnetic layer or pinned 5 (column 11, line 40, i.e., cobalt-iron alloy), the tunnel barrier layer 4 comprising a titanium alloy oxide (column 8, lines 25-28,

i.e., strontium titanium oxides) on the first ferromagnetic layer 5, and a second ferromagnetic layer or free layer 3 (i.e., nickel-iron alloy, column 11, line 38) , wherein the tunneling magnetoresistive stack exhibits a negative exchange coupling between the first and second ferromagnetic layers 5 and 3 (column 11, lines 30-36, i.e., as the magnetization direction of the layer 3 is directed in the opposite direction to the magnetization of the layer 5, there exhibits a negative exchange coupling between these two layers). Since each of the first and second ferromagnetic layers has different composition of material of different polarity, to utilize in Kreupl in the present or absence of an applied magnetic field would not yield any substantial different result in order to exhibits a negative exchange coupling between these two layers would be within the purview of obviousness to one having ordinary skill in the art.

Claims 4, 17, and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kreupl in view of Chen et al (US 6,183,859) cited in the previous Office Action.

Kreupl discloses substantially all features of the claimed invention except for the dopant is an element of the group consisting of Nb, Cr, Mo, P, Si, V, W, B, and Co. Chen et al discloses the use of oxidized aluminum alloys layer having titanium and other dopants of trace metals including Ta or Si (column 3, lines 35-60). It would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize in Kreupl the dopant taught by Chen et al in order to reduce pinholes commonly occurred in the tunnel barrier layer during oxidization process.

Claims 1, 3, 5-16, 29-35, and 37-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Parkin (US 5,764,567) in view of Carey et al (US 6,756,128), both cited in the previous Office Acton. Parkin discloses all features of the claimed invention at Figs. 6 or 10 which includes a tunnel stack having first and second ferromagnetic layers and tunnel barrier layers as noted. Claim 2 of Parkin discloses that the coupling between the free and pinned layers can be parallel or non-parallel in the absence of an applied field, the anitparallel state being the negative exchange coupling of the claim. Also, at the top of col. 7, it appears that there is negative exchange coupling since there is antiparallel coupling at small negative fields. Parkin fails to disclose the use of Titanium alloy oxide for the barrier layer with a dopant and the thickness less than 30 Angstrom . Carey et al discloses the tunnel barrier at the abstract and at col. 2, lines 1-60, and col. 4, lines 30-50 where it is noted the $TiAlO_xN_y$ with N is considered the dopant for the titanium alloy oxide with the thickness of 7 Angstrom. It would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize in Parkin the barrier material taught by Carey et al in order to lower the resistance and noise and to improve signal to noise ratio.

REMARK

Applicant's arguments with respect to all rejections of the claim have been considered but are moot in view of the new ground(s) of rejection.

In response to applicant's argument that there is no teaching of negative exchange coupling between the first and second ferromagnetic layers suggested in the prior art. The Examiner disagrees as for the reason set forth in the rejections above.

Furthermore, the use of titanium alloy oxides having aluminum and dopant for the barrier layer disclosed by Carey patent would provide the tunneling magnetoresistive stack with negative exchange coupling. The fact that applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985).

Applicant's arguments do not comply with 37 CFR 1.111(c) because they do not clearly point out the patentable novelty which he or she thinks the claims present in view of the state of the art disclosed by the references cited or the objections made. Further, they do not show how the amendments avoid such references or objections.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tu Ba Hoang whose telephone number is (571) 272-4780. The examiner can normally be reached on Mon-Thu from 8:00AM to 6:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Elvin Enad can be reached on (571) 272-1990. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Tu Ba Hoang

Primary Examiner

Art Unit 2832

June 12 2006